INDIAN MUSICOLOGY
Research Methodology and Theory Construction

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New Era

An effervescent upsurge of effort towards national reconstruction has emblazoned new dimensions in Indian musicology also in the last quarter of this century. New orientation in values and purpose, a larger and deeper perspective, enrichment with methods, techniques and findings from allied or adjacent disciplines, systematic approach to source materials and their interpretation, new interpretative and comparative techniques, emphasis on contemporary relevance, greater rapport between the empirical and the academic, increase in the volume of expression in musical and musicological thought, development of a professional rather than amateur, approach to problems etc. are among such welcome changes. Very much more remains to be accomplished, of course: musicology has still to keep pace with music, intradisciplinary coordination is a serious desideratum among various aspects of musicology; development of virgin but fertile areas of ethnomusicology, musical pedagogy, musical psychoacoustics, systematic study of musical media, institutionalisation of musicological research, textual criticism, popularisation media for dissemination of musical knowledge and understanding, enegetical methods in textual and experimental studies, musical semantics etc. are but a few aspects among many in Indian musicology which await our attention and effort.

Among the least developed areas in Indian musicology is the psychology of music. The subject has been amazingly and regrettably, neglected in India in the past and in the present. The more important textual documents in Indian music have only recorded schools of opinion or empirical findings largely overlapping the areas of aesthetics, acoustics and semantics. No clues are available as to the experimental techniques or apparatus, to the methodology developed or to tests of validity. Unfortunately, much of ancient textual contents in musical psychology have suffered misinterpretation due to lack of insight or lack of technical or linguistic equipment. Again the area, scant as it already is, is inundated with pseudopsychological or spurious theories, views or opinions in the last two hundred years or so. If the psychology of Indian music is to bloom into a full fledged, systematic body of knowledge and investigation, the need for a musicologist to be musician and trained psychologist and *vice versa* can hardly be overemphasized.

This is hardly surprising because psychology itself emerged as a distinct science only about 150 years ago or so, and psychology of music, less than 50 years ago, in the West. It is a dismal paradox that notwithstanding a veritable storehouse of materials and problems for study, many of them quite unique and pregnant, psychology of Indian music is yet the veriest infant. This is why I have ventured to suggest some areas for systematic investigation in the field (in a forthcoming book.)

In the light of the foregoing, it will not be inappropriate to preface this paper with a few general remarks on the philosophy of scientific research and scientific method.

Pitfalls in Musicological Research

Paucity of critical and creative scholarship in a nation is a mark of its cultural sterility and of intellectual decadence. Research in various branches of knowledge alone can bridge the present with the past and with the future. It is our saviour from stagnation and a sign of progress. It is also an emancipation from prejudice and fallacy and is therefore a powerful mental discipline. It is the adventure of adventures, affording the excitement and romance of discovery. The aesthetic experience of realising a pattern and gives the courage and conviction of truth. It is therefore imperative that this goddess of learning shall not have feet of clay if we are to deserve our great inheritance and if we are to participate in the conclave of international scholarship.

The research investigator in general and the musicological investigator in particular should carefully guard himself against many common pitfalls. His work should be actuated and sustained by an uncompromising honesty: ethical and intellectual integrity. Unacknowledged borrowing, deliberate misquotation or misextraction to suit one's convenience, sensational ornamentation of trivial discoveries, adjusting or adopting facts to a theory, elevation of personal feeling or fancy to the plane of theory or fact, dogma dressed up as doctrine and lack of integrated outlook are among such pitfalls in the sojourn on the narrow and straight route to truth. His work is the discovery or interpretation of facts, not their creation. A fact needs no sensational or spectacular embellishment for its appeal or foundation. A fact is like a point: it has no discrimination of dimension or direction whereas a theory is like a line: it has both direction and magnitude. A fact is amoral and its strength does not diminish with diminished application.

Research Work: Three Levels

All research work proceeds at three levels: a) preparation or heuristics (b) observation or discovery of facts and (c) conceptualisation or theory construction.

A basic equipment for preparation is a thorough background in the types of disciplines associated with the project on hand. The consciousness of a problem and its ramifications must grow in the mind of the investigator to the point of the irresistible urge. He should select a problem well within his personal equipment, limitations and capacities, availability of necessary materials and apparatus and the time factor involved. A firm grasp of the semantics and epistemology of the investigated discipline is equally important for orienting the problem and its evaluation. The problem need not be sensational or comprehensive. Apparently trivial points or very specialised investigations very often stimulate or lead to major discoveries or significant generalisation. As far as is exigent, the problem should be such that its solution fits into a larger and more general pattern of knowledge in the mosaic of intradisciplinary and interdisciplinary knowledge. Of course, the problem should admit of a systematic investigation and of a general solution.

Awareness of the problem should next lead to a clear unambiguous statement of the problem. This is of great importance because the nature and scope of the answers depend on the question; the statement focusses investigation on the essentials and highlights of the problem; it fixes the discursive scope and span; it reflects the nature of the discipline. What is equally, if not more, important, it inheres a methodology in relation to the entire system or body of the discipline.

Method

Every problem inheres its own method for solution, based on its individual nature, scope and merits. Method may be broadly divided into analytical and synthetic. In the analytical method the problem is first broken up into a number of component issues, which are then clearly, explicitly and exactly stated. Answers are then sought to each issue systematically, individually or in groups if the issues can be logically and naturally grouped into clusters. The borderline between one issue and another and between one cluster and another may be real or imagined, logical or arbitrary or may be dictated merely by convenience. Careful study of such overlap is essential in the context of the mutual relations of the individual issues or their clusters and of their contribution to the overall theory of the phenomenon in question. Then the answers are put together, always remembering that the whole is always greater than the sum of its parts, especially in hermeneutic or empirical research work. Thus this dictum implies that, far from underestimating the importance of details, it is necessary to collect every scrap of every fact in detail, notwithstanding the fact that some of it may not appear significant, but when assembled together all these will reveal a meaningful pattern, a generalisation, a conceptualisation. The investigator should organise his method and materials to converge into an ultimate unity.

In the synthetic method, a probable working hypothesis is formulated in one or more stages. Then it is studied piecemeal or whole, in the context of available facts. The hypothesis is rejected, modified, amended, adapted or enlarged by such systematic, continuous study unitil it becomes the ultimate generalisation.

The problem on hand may require the analytical or the synthetic method or both, in parts. Throughout the work, the investigator must aim at convergence of all the different strands of enquiry. He must explicitly and unequivocally state the results of his investigation as well as the circumtances and limitations surrounding the method.

Heuristics

The quality and course of the investigation are always considerably influenced by the initial heuristics, that is, the collection and organisation of the materials of study and investigation. Collection of every relevant datum on the various aspects of the problem is the *sine-qua-non* of a sound investigation. This enables the worker to spot out duplication of labour-and to note the methodological, experimental or exegetic imperfections and limitations of previous attempts, if any. Such data often indicate current trends of thought. The investigator may save himself, through systematic and thorough heuristics, much trouble in the design of apparatus, experimental technique or other investigative tools.

Whenever a fact has to be established in a chronological perspective that is, when a historical method is involved, it is necessary that all the relevant primary sources, documental or otherwise as well as secondary sources such as florilegia and testimonia should be collected, authenticated, analysed and evaluated. Secondary sources should be admitted only as circumstantial evidence in the absence, weakness or inadequacy of primary sources. A comprehensive bibliography and the assimilation of its material is a guard against errors of fact and plagiarism. It is indispensable to all systematic work.

However, it is incumbent on the investigator to discover by continuous study the criteria for the classification and organisation of his vast collection of data. A mere, voluminous bibliography, though perhaps impressive, is hardly proof of the soundness of the thesis. The investigator will do well to apply rigorous tests of authenticity to his materials of study before their use, because indiscriminate, undiscerning dependence on external sources mars the quality of research work. It would be to his advantage, in so far as the discipline or methodology allows, to test the reliability of his major premises he has obtained from heuristics, by actual equipment or verification.

Observation

All scientific work commences with, and is based upon, observation. Having decided upon the phenomenon or phenomena for observation and conceptualising, the investigator proceeds to set up the conditions and criteria for exact observation. He devises an experiment, that is, sets up exact, controlled, specific conditions in which the given phenomenon occurs and repeats. Exact observation implies the avoidance of malobservation and nonobservation.

The ultimate purpose of scientific investigation is to construct a theory to explain a phenomenon or a body of phenomena on the basis of objective data gathered from observation of an experiment or group of experiments which are carefully designed to yield facts on one or more issues of the problem taken up for investigation. It is necessary to emphasise here that the problem raised should admit of analysis into one or more simpler issues and of yielding empirical data which may be observed, and measured directly or indirectly. Much manpower and time is wasted in posing pseudo-problems which do not admit of empirical resolution or solution because the component issues, if any, do not possess factual or experimental correspondence.

The first phase of theory construction is controlled observation. This involves the control of dependent variables in an experiment, situation or phenomenon so as to study their influence on major independent variables and to eliminate extraneous conditions. Such elimination of irrelevant variables or factors lying outside the scope of the problem may be accomplished using statistical procedures and is carried out to determine precisely the relationship between the independent and dependent variables. Control of observation of events is similarly carried out by devising suitable experimental devices to avoid extraneous elements.

Constructs

Next, the investigator employs constructs to construct a theory. A construct is a special kind of concept, relating to an object, property, phenomenon, situation or relationship. A fundamental criterion of choice and use of a construct is its operational specificity in conjunction with the principle of parsimony. That is, every construct employed must have clearly stated empirical referents. This helps in maintaining a reasonably critical evaluation between the observational base of the investigated phenomenon and its corresponding logical conceptualisation. It is equally important, that when the problem is decomposed into final issues, the constructs must be the simplest of possible, alternative logical models. This applies vigorously and rigorously to the physical sciences but in such areas as psychology or art where the referents are often ill-defined and are only approximately measurable and are synthesised out of multidisciplinary bases, operational specificity may be applied within limits of feasibility while formulating the problem and the degree of vigor be gradually enhanced as the operational or referential bases become more and more analysable.

Two types of constructs may be noticed here: the intervening variable and the hypothetical construct. The intervening variable has a causal—at least, a chronological—relationship and intervenes between the antecedent condition (e.g. stimulus in psychology, sound in music etc.) and the consequent condition (e.g. response in psychology; hearing, feeling, imagination etc. in music) and is an intermediate, abstracted term. It is univalent in either direction and has no surplus meaning outside its relationship between the two conditions. It has a considerable functional value in theory construction because of high transparency and high operational specificity. Its relationship between the two conditions may sometimes involve speculated or imagined properties. Its very operational specificity may make the intervening variable less elastic or less flexible to generalisation, which is the primary aim of theory construction. But these defects are more or less common to all constructs and need not bother the investigator specially.

The hypothetical construct may be regarded as a polyvalent intervening variable with surplus meanings between the antecedent and consequent conditions, which are vague and unspecified. Therefore it has low clarity and low operational specificity. Such constructs also have low pasimony; that is, the explanations they offer for the investigated phenomenon or its issues are fairly complex. As a consequence of poor definition, complexity, vagueness and multidirectional semantic potential, they should be used with care to guide or direct research rather than to predict. These two types of constructs are somewhat opposing in function, scope and purpose. But they become excellent investigative tools if their role and functions are explicitly and clearly grasped.

Hypothesis

The investigator then, employs constructs to formulate a hypothesis, which may offer a provisional explanation of the investigated phenomenon or may enunciate the relationship between the different kinds of variables involved in the problem. The validity of a hypothesis is in direct proportion to its testability. The greater the rigor of the test, the greater the applicability of the hypothesis. Thus it should possess rigidly logical relationships directed towards empirical data and offer means of a reasonable control over the several variables. Thus testability lies both in the logical and empirical bases, leading to both discovery and confirmation. These two consequences of a hypothesis should be regarded as its functional necessities.

A hypothesis may be experimental in which case it may be tested by direct observation, it may be abstract, testable only cumulatively, that is, by determining the total effect of several observations of one or more of its concrete referents. Possibility of direct testing is again, in direct proportion to the specificity of the hypothesis, espectally if it is data oriented, though sometimes a theory oriented hypothesis may be logically tight and adequate, while an empirical hypothesis may be vague and equivocal.

Theory

Every endeavour in scientific investigation converges to, and culminates in theory construction. The term 'theory' is used to connote one or more of several things: It may mean simply any process of formalisation or conceptualisation in scientific work. It may refer to a generalised explanatory proposition. Theory in this sense should be distinguished from hypothesis which is a *provisionally* explanatory proposition. It should further be distinguished from law which consists of a compact but comprehensive enunciation of regular and predictable relationships among the empirical variables involved in a phenomenon. If the proposition states a *functional* relationship between the variables it is called theory. If it states regular, more or less quantitatively determinable relationships among empirical variables such that the consequent condition may be reproduced by reproducing the antecedent condition, it is called theory. Next, theory may also mean a cluster of logically organised laws. In this sense it is structurally somewhat similar to system, which is a cluster of theoretical propositions, method orientations and operational techniques. Of course, from a positivistic point of view, theory may simiply mean an ordered description of the empirical laws of a given discipline.

The necessity for theory construction arises from the fact that direct observation of the causes and mechanism of a phenomenon are not always possible. In other words, the empirical referents involved in a phenomenon do not always reveal the logical relationships amongst themselves *prima facie*. Therefore, an inferentially derived proposition or set of propositions becomes necessary. Such a cluster of proposition is based on concrete sensory data of course, but cannot be completely or finally reduced to its factual content alone. Thus observation, systematically arising out of controlled experiment and conceptualisation are interdependent.

What are the functions of a theory? A theory must serve both as a means and as an end. It is a heuristic tool and in this capacity, must arrange its contents so as to make possible new predictions at an empirical level. It guides observation and discovery besides offering an explanation. Theory may also be an end in itself and is, in this role, deductive. It integrates existing empirical laws. It serves as a powerful repository of abstraction, codification, integration. summary and as a bank of facts.

We may next consider the *modus operandi* of theory. It must be made clear at the very outset that an investigator seldom formulates theory deliberately according to rules. More often than not, he realises the core of the theory as a mental, creative flash around which he builds up the details or ratiocination. Such realisation may often appear to be intuitive and sudden, after the issues and empirical data seem to be hibernating in his so called 'subconscious' mind for some time or are continuously worked up in exclusive mental focus to the boiling point. Therefore, a consideration of how theories should be formed may appear to be futile or even ludicrous. This is especially so since a scientific theory seldom conforms strictly to any single type of theory mentioned below. Notwithstanding this, an account of different types of theory is given here for two reasons: First, every scientific theory may be analysed finally into elements which may be definitely classified under the one or the other type. Second, and more important, an intimate knowledge of the types of theory undoubtedly adds to the efficiency of theory construction in serving as an intellectual, disciplinary habit, just as a thorough knowledge of the principles and techniques of music adds to the quality of musical creation and musical appreciation.

Types of Theory

(*a*) *Model Based Theory*

A scientific theory may be typed as model based, deductive, functional and inductive.

A theory is said to be model based if it employs one model or more from an extraneous discipline. A model is a conceptional analogue or conceptual correspondent, drawn from a source which is not native, or foundational, to the theory. Models may be drawn from concrete, empirical referents or from mathematics. The former is usually referred to as pictorial. The chief value of a model is initial and heuristic; it affects, and is affected by, subsequent conceptualisation processes. Thus a model is, largely, a tool used at the beginning of theory construction and is generally discarded after its purpose is served. Then theory construction proceeds in terms of other types. If the model is based on the relationship between a conditioning and its consequence, an individual property or a body of properties is extrapolated from the model to the theory in order to increase the predictive potential of the theory in terms of the empirical elements of the phenomenon. It is necessary during such transposition—or even during arbitrary assignment—to retain both intrasystemic and intersystemic consistency. In other words, after such extrapolation the various elements constituting the model and the theory should retain exactly the same relations among themselves respectively and should bear exact and constant correspondences mutually.

Secondly, a model may be based on any given body of relationships such as mathematics. Thus it serves as a set of inferential rules. The apparatus for the theory is simply its premises and an argument. The result is a set of predictions. Thirdly, a model, besides involving an inferential process, may also interpret the process itself, thus contributing to a more efficient and clearer communication. Sometimes the interpretation may supplement or complement the semantic content of the system derived from its symbolic elements. Fourthly, a model may simply be pictorial, by projecting a visual or mental image in lieu of a theoretical prototype. Such an image may be formed by vigorously and rigidly putting together its component elements in which case it becomes enduring and fertile, or it may be simply a loose or vague sensory analogy in which case it becomes transitory and sterile.

To summarise, then, a model should fulfil the following functions: a) to help the investigator to firmly and clearly grasp complex systems or events through simplification or familiar and vivid analogy, not only of concrete objects or phenomenal events but also theories, concepts and ideas.

(b) to help to learn complex skills, if used as training devices or to help manipulate elements of conceptualisation more efficiently.

(c) to help the investigator to acquire a new insight, perspective or view-point and thus aid creativity in conceptualisation and aid further research.

(d) to help the investigator to realise the pragmatic or experimental limitations of a theory.

If these are the advantages of using a model, the risks include a tendency towards overgeneralisation beyond the limits strictly required by correspondence between the model and the theory, a tendency for the investigator to commit himself to a particular view-point and by the very nature of divergence between the areas of the model and the theory, to inhere a logical fallacy of seeing, because of analogy, relationships among the elements of the theory which do not really belong there; to incorrectly presume the variables and constants of the model into the theory also.

The efficiency of a model depends on two factors:

(a) the degree of facility with which extrapolation of properties between the empirical and conceptualised levels or between the model donor system and the dance theory.

(b) the degree of exactness or consistency sustained intrasystemically and intersystemically in the donor and dance systems.

(*b*) *Deductive Theory*

The second type of theory is based on logical co-ordination among its elements rather than on a model. Naturally enough, the chief value of this theory lies in its deductive strength derived through the arrangement of the embodying laws. In other words, the empirical bases of the theory are conceptualised in a multidirectional way and projected obliquely towards the theory in addition to the regular, direct relationship of correspondences. Again, the logical structure of both the elements and of their sum is firm and rigid. But a common pitfall of such theorisation is its foundation on imperfect, imprecise or inadequate empirical ground. Another possible danger is one of isolation in the false belief of security and infallibility; that is, the tendency to underestimate the importance of empirical evidence and of empirical tests. It may exaggerate the value of speculation undesirably and prematurely even before adequate experimental data are collected or heuristics are developed.

(*c*) *Functional Theory*

The third type of theory is called functional since it emphasizes its functions more than its conceptualisation techniques. That is, it is more concerned with what it ought to do rather than why. As a consequence, the relationships between the data and the theory are reciprocal. Thus data collection promotes conceptualisation and vice versa. True, this theory is liable to lose definition and specificity through a tendency towards eclecticism, but this type is popular among various disciplines because the investigator is not prematurely committed to any particular logical or formal position and may go on adapting his conceptualisations and constructs to newer data. Thus the process is continuous and dynamic.

(*d*) *Inductive Theory*

The fourth type of theory is designated as inductive and may be regarded as the opposite of deductive theory in that it aims to keep its conceptualisations and inferential propositions to a minimum and relies on the comprehensiveness and infallibility of its data. Thus the theory is reduced largely to a summary of the data, involving of course, a certain amount of conceptualisation and formal or logical position which is implicit in the choice and arrangement of its data. Relationships are of necessity of matter, of arrangement and of structural configuration. Such a theory would not readily admit of interdisciplinary perspective or of a synthesis towards a unified theory of reality—subjective or objective.

Thus all theories may be finally analysed into verbal, calculational (or abstract relational) and analogous.

Reductionism

We have seen from the foregoing that one of the main functions of a theory is to explain the investigated phenomenon, that is to set up a body of inferential propositions not inhered in the empirical referents. We may now ask: how does a theory proceed to do this?

There are mainly two ways in which a theory explains phenomena. Firstly, it reduces phenomena into component basic levels of description or definition after projecting into multiple disciplines which are related to each other as tier upon tier or simply clustered at lower levels. These various levels of phenomena should be related functionally among them selves. This is called Reductive Method. Methodologically, reduction makes the following assumptions:

(a) an heirarchical relationship among the disciplines at various levels.

(b) validity of extrapolating terms, concepts and relationships from an heirarchically lower discipline into a higher one without loss in logic or in content.

(c) progressive derivability in the empirical data and conceptualisation only vertically upwards, and in the case of closely allied borderline disciplines, by horizontal association.

(d) locus of causal relationship among the 'reduced' or heirarchical disciplines along with, or parallel to, derivability.

Two criticisms are generally levelled against reductionism: that its final solution is largely empirical in nature and that it stresses too much dependence—or interdependence—at the cost of autonomy. While these are valid enough, it must be remembered that knowledge of a phenomenon is verified and indivisible *per se*. That is, stratification of a phenomenon in terms of heirarchical disciplines is not merely a convenience but a methodological necessity, in view of its being a necessarily analytical tool of a scientific investigation. In other words, each level is inadequate in itself in terms of empirical, conceptual and logical content vis-a-vis the observed phenomenon, but may be used to build up into a pyramid of integrated theory. Autonomy implies not only self sufficiency, but also isolation. It is highly questionable whether any branch of knowledge can afford to remain really autonomous for long.

Constructive Method

Such heirarchical differentiation is not always possible; for example, in physics or chemistry, such stratification is largely intradisciplinal or simply reciprocal. Mathematics is used only as a model donor and not in an heirarchical relation. In such cases as well as in disciplines allowing the reductive explanation, the constructive method is employed. Here the phenomena are described in progressively higher and/or more abstract constructs, the hypothetical variety being more frequently employed. Here the constructs are introduced to state, postulate or determine logically what variables, other than those controlled, determine the consequent condition. Despite the methodological extremes, both types of explanation should be regarded, and used, as mutually complementary, rather than mutually exclusive.

Validation Tests

We may conclude this enquiry with asking—and answering—a final question: How can we know that a theory so constructed is valid? In other words, how far may we rely on it? What is its truth value?

It is interesting to ponder—though somewhat outside the scope of this paper—that epistemologically, no validation tests can ever be devised for a theory. For, here is a paradox: No theory is really complete or logically valid unless it is autonomous in regard to its content and form; self-sufficiency is its first logical requirement. But testing implies external criteria and external tools. For, no logical proposition may use its own premises, constructs, postulates etc. for self examination without being guilty of the logical fallacy of *petitio principii.* Thus inductive theories, almost entirely based on empirical data, would require a battery of logical tests, and deductive theories which are, or should be, purely logical in structure would require a battery of empirical tests to validate them and this very fact intrudes on their self-sufficiency and therefore invalidates the theory of tests. Further, in the case of deductive theories, for example, their specific validity is always open to serious question because it is virtually impossible to eliminate every other theory to account for the investigated situation. That is, it is almost impossible to ignore the possibility of there being an alternative body of constructs, postulates, hypotheses, models etc. which would not equally explain known facts.

Fortunately however, this is somewhat irrelavent to our present consideration. For, ultimate truth or reality which presumably lies behind or beyond the sensory world of apparent reality is a concern of the epistemologist and the philosopher. This lies outside the perimeter of scientific investigation because the interlocking of data and conceptualisation, i.e., of external referent and logic is not merely the starting point of all scientific investigation, but its very foundation, its *sine qua non*. The scientist, indeed, is hardly ever ambitious of discovering a law or of constructing a theory to describe or explain 'real' truth or ultimate reality; for this assumes a knowledge of such truth or reality which is not in evidence. Secondly, the very nature of his method precludes it, because the body of scientific knowledge grows by a continuous process of change in its logical equipment through adaptation, modification, restatement or even total abandonment, parallel to the growth in the data content of the phenomenon.

This therefore introduces the methodological need for testing an inductive theory with logical tools and *vice versa* at one or more critical stages. This point is worth repeating: a deductive theory has to be tested on the anvil of fact. The firmness and strength of the logical structure of the tests is a measure of success of the theory in fertility and predictability. Therefore, all that can be done, and is needed, is to determine the degree of probability in a deductive theory through empirical verification. But this is not to be disparaged because it serves the two basic aims of theory construction in science: to add to its empirical predictability and to enlarge its empirical applicability.

Similarly an inductive theory, on the mere strength of its so called factual foundation should not be regarded as providing proof of its own validity. In the first place, the history of science has proved too conclusively the ephemeral nature of the so called fact. In the final analysis, fact is as much a construct as any logical tool. Fact and theory have changed their mutual positions so frequently that in the recent past the former no longer enjoys security, sanctity or connotational firmness which permanence confers. Progressive refinement in measuring devices and techniques has yielded data which often render previous work too imprecise, or often give new direction to theory or necessitate new constructs.

Further, inductive theory is constructed through generalisation. Specificity of the circumstances and concomitants of the investigated phenomenon are replaced by general variables. Infallibility and reproducibility are functional criteria in constructing an inductive theory. As a consequence of such large dependence on empirical referents, its interpretational and predictive potential would emerge only from the logical relations by which the data structure of the theory becomes coherent and consistent. Since the data structure is admitted only after rigorous experimental or observational testing, what remains to be done is to test the intra-elemental logical relationships. This is the critical part of the theory. For, logical argument is inherently incapable of explaining or predicting the phenomenon of exception in an inductive process. The tests applied in the conceptualisation part of the theory thus, would have to be adequate to compensate this risk which is integral with the method.

There is yet another aspect of testing theory. The above considerations apply to the external or functional structure of the theory. But how about the internal structure? What tests should be applied to the actual core of the theory, viz., the explanatory propositions? In reality, no such tests have been so far developed. However, the law of parsimony i.e. the preferability of the simpler of given alternative propositions, is often applied as a test. But this is largely an aesthetic consideration rather than a formal or metatheoretical one. The assumption that explanation is, or should be, always simple is open to question because it is tantamount to an imposition of an entirely extraneous, and perhaps untenable, condition on national phenomena of which the investigator is also, and only, a part. Secondly, the bias of the investigator i.e. the particularity of viewing position can never be completely eliminated from the phenomenon, the data, the constructs or the theory. A consequence of Heisenberg's principle of uncertainty is that observation and measurement can never be absolute and exclusive of each other. Third, such assumption (viz. the applicability of the law of pasimony) discounts complex explanatory propositions which may, after all contain the truth and there is no way of finding out whether the discarded theory did or did not contain the true explanation. Further, simplicity is a relative term and its appeal is largely a matter of general acceptance, and acceptance by a larger number of people is no real proof of truth in a theory. It must always be remembered that the referential world is a mental construct and its knowledge is limited by the limitations of the enquiring mind. Aside from the question whether there is any reality other than the one which the mind can investigate, refining of the mental and physical tools of investigation has shown that the external world *does* change with change in the outlook. Truth and beauty may not be finally analysable into simple elements in philosophy. But this proposition is hardly tenable in scientific investigation because experience of the world of empirical referents is undoubtedly verified and complex. Its analysis into aspects, levels, components etc. is ultimately an inevitable methodological necessity. Such analytical simplification holds no intrinsic guarantee that synthesis of the corresponding conceptualisations or explanatory propositions does, or should, result in a simple product. The probability of theory would increase with its capacity to describe or explain our experience as accurately as possible and in the context of its unity and complexity.

Next, fluency in the pragmatic application of a theory is often claimed as justification of parsimony. This is true only slightly. In my opinion, theory construction should not be fettered with extraneous considerations. Another justification offered for parsimony is the observation that replacement of a theory is noticed to be in the direction of simplicity rather than complexity. This is not always true; such justification may be contradicted with numerous illustrations from several disciplines especially where reconciliation of interpretations of duality or multiplicity of behaviour is concerned.

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